

WHAT IS CLAIMED IS:

1                   1.       A method for enhancing venous return to the heart, the method  
2 comprising:  
3                   delivering a positive pressure breath to a person suffering from low blood  
4 pressure or head trauma;  
5                   actively extracting respiratory gases from the person's airway following the  
6 positive pressure breath to create an intrathoracic vacuum to enhance venous return to the  
7 heart; and  
8                   repeating the steps of delivering positive pressure breaths and extracting  
9 respiratory gases.

1                   2.       A method as in claim 1, further comprising interfacing an impedance  
2 threshold valve to the person's airway, wherein the threshold valve prevents airflow to the  
3 person's lungs when attempting to inspire until the threshold valve opens, thereby augmenting  
4 blood flow back to the heart.

1                   3.       A method as in claim 2, wherein the threshold valve is configured to  
2 open when the negative intrathoracic pressure exceeds about -7 cmH<sub>2</sub>O.

1                   4.       A method as in claim 1, further comprising interfacing a flow limiting  
2 valve to the patient's airway and regulating the pressure or the volume of the positive pressure  
3 breath with the flow limiting valve.

1                   5.       A method as in claim 1, further comprising interfacing a pressure  
2 source and a vacuum source to the person to deliver the positive pressure breath and to  
3 extract the respiratory gases.

1                   6.       A method as in claim 5, wherein the pressure source and the vacuum  
2 source comprise a compressible bag system.

1                   7.       A method as in claim 6, further comprising reconfiguring the  
2 compressible bag system to operate only as a pressure source.

1                   8.       A method as in claim 1, further comprising exhausting the extracted  
2 respiratory gases to the atmosphere.



1                    9.        A method as in claim 1, further comprising varying the duration of the  
2 positive pressure breaths or the extraction of the respiratory gases over time.

1                    10.      A method as in claim 1, further comprising supplying supplemental  
2 oxygen to the person.

1                    11.      A method as in claim 1, further comprising monitoring at least one  
2 physiological parameter of the person and varying the positive pressure breath or the  
3 extraction of respiratory gases based on the monitored parameter.

1                    12.      A method as in claim 11, wherein the physiological parameters are  
2 selected from a group consisting of end tidal CO<sub>2</sub>, oxygen saturation, blood pressure and  
3 cardiac output.

1                    13.      A method as in claim 11, further comprising varying the amplitude of  
2 the positive pressure breath or the extraction of respiratory gases.

1                    14.      A method as in claim 6, wherein the respiratory gases are extracted  
2 upon recoiling of the compressible bag system.

1                    15.      A method as in claim 1, wherein the intrathoracic vacuum lowers the  
2 person's intrathoracic pressure to about -1mm Hg to about -20mm Hg, and wherein the  
3 intrathoracic vacuum is in the range from about -2mm Hg to about -60mm Hg.

1                    16.      A method as in claim 1, further comprising measuring the volume of  
2 the positive pressure breath.

1                    17.      A method as in claim 11, further comprising transmitting information  
2 on the measured parameter to a remote receiver.

1                    18.      A method for treating a person suffering from cardiac arrest, the  
2 method comprising:  
3                    repeatedly compressing the person's chest;  
4                    preventing or impeding respiratory gases from flowing to the person's lungs  
5 for at least some time between chest compressions;  
6                    periodically delivering a positive pressure breath to the person;



7 extracting respiratory gases from the person's airway following the positive  
8 pressure breath to create an intrathoracic vacuum to enhance venous return to the heart.

1 19. A method as in claim 18, further comprising coupling an impedance  
2 threshold valve to the person's airway to prevent or impede the flow of respiratory gases.

1 20. A device for manipulating intrathoracic pressures, comprising:  
2 a compressible bag structure;  
3 an interface member coupled to the bag structure that is configured to interface  
4 with a person's airway;  
5 a one way forward valve coupled to the bag structure to permit respiratory  
6 gases to flow to the person's airway upon compression of the bag structure;  
7 a one way exit valve coupled to the bag structure to permit respiratory gases to  
8 be pulled from the person's airway upon decompression of the bag structure, thereby  
9 producing a negative intrathoracic pressure.

1 21. A device as in claim 20, wherein the forward valve and the exit valve  
2 are selected from a group of valves consisting of a spring loaded check valve, a fish mouth  
3 valve, a ball valve, a disc valve, a baffle, a magnetic valve, and an electronic valve.

1 22. A device as in claim 20, wherein the bag structure is configured to  
2 produce a vacuum in the range from about -2mm Hg to about -60mm Hg to produce a  
3 negative intrathoracic pressure in the range from about -1mm Hg to about -20mm Hg.

1 23. A device as in claim 20, further comprising an impedance threshold  
2 valve coupled to the compressible bag structure, wherein the threshold valve is configured to  
3 permit respiratory gases to flow to the person's lungs once a certain negative intrathoracic  
4 pressure is exceeded.

1 24. A device as in claim 20, further comprising a flow limiting valve  
2 coupled to the compressible bag to regulate the flow of respiratory gases to the patient's lungs  
3 upon compression of the bag structure.

1 25. A device as in claim 20, further comprising a switch for permanently  
2 closing the exit valve.



1                   26.     A device as in claim 20, further comprising an exhaust valve coupled  
2     to the bag structure to permit respiratory gases pulled from the person's airway to be  
3     exhausted to the atmosphere.

1                   27.     A device as in claim 20, further comprising an oxygen source to  
2     provide supplemental oxygen to the person through the interface member.

1                   28.     A device as in claim 20, further comprising at least one physiological  
2     sensor operably coupled to the compressible bag structure to measure at least one  
3     physiological parameter of the person.

1                   29.     A device as in claim 28, wherein the physiological sensor is selected  
2     from a group consisting of end tidal CO<sub>2</sub> sensors, oxygen saturation sensors, blood pressure  
3     sensors and cardiac output sensors.

1                   30.     A device as in claim 28, further comprising a transmitter coupled to the  
2     sensor to transmit information on the measured parameter to a remote receiver.

1                   31.     A device as in claim 20, further comprising a regulation valve coupled  
2     to the bag structure to regulate the rate of flow of respiratory gases to the person's airway and  
3     the pressure of the respiratory gases delivered to the person's airway.

1                   32.     A device as in claim 20, wherein the bag structure comprises a  
2     ventilation chamber that supplies respiratory gases through the forward valve upon  
3     compression of the bag structure and an expiration chamber that receives respiratory gases  
4     from the person through the exit valve upon decompression of the bag structure.

1                   33.     A device as in claim 20, wherein the bag structure further comprises a  
2     venturi system that pulls respiratory gases from the person's lungs upon decompression of the  
3     bag structure.

1                   34.     A device as in claim 20, wherein the bag structure is constructed of an  
2     elastomeric material.

1                   35.     A method for treating a person suffering from low blood pressure, the  
2     method comprising:



3                    preventing or impeding respiratory gases from flowing to the person's lungs  
4    for at least some time;  
5                    periodically delivering a positive pressure breath to the person;  
6                    actively extracting respiratory gases from the person's airway following the  
7    positive pressure breath to create an intrathoracic vacuum to enhance venous return to the  
8    heart.